

Occupational Medicine

Analysis of Pregnancy-Related Calls to an Occupational Hazard Hot Line

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Since 1980 the Hazard Evaluation System and Information Service has responded to over 11,000 inquiries regarding workplace health hazards. Of 2,424 inquiries in 1986, 593 (24%) concerned hazards to pregnancy. This represents a 17-fold increase since 1981. Most pregnancy-related inquiries were from employees (70%) and health care providers (23%). Referral sources for the employee calls were almost exclusively individual health care providers or institutions that provide health care or health counseling, or both. These data suggest that pregnant employees seek information on their own or from health care providers instead of from employers. Of the inquiries, 80% were for general pregnancy hazard information; 20% involved symptomatic pregnant employees. Most inquiries concerned employment in the services (58%) and manufacturing (26%) sectors. Organic solvents, pesticides, acrylic nail-grooming products, lead, and video display terminals were among the agents about which callers inquired most frequently.

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During the past decade, toxic substances in the home, community, and work environment have received increased attention. There is special concern about reproductive hazards in the workplace, where an estimated 50,000 chemicals are used and 3,000 new chemicals are introduced each year. Women are increasingly taking jobs that involve exposure to chemicals. Currently, women constitute close to 50% of the labor force in California, and a majority are of childbearing age.¹ Many women who are pregnant or planning pregnancy are now acutely aware of the chemical, physical, and biologic agents they encounter on the job.

One result of the growing awareness has been an increasing demand for information on workplace pregnancy hazards. Pregnant employees and others are thus turning to resources such as the Hazard Evaluation System and Information Service (HESIS) for information.

After the discovery of reproductive-system damage in male workers exposed to dibromochloropropane,² HESIS was established in 1979 by the California legislature to prevent such occupational illnesses. The Hazard Evaluation System and Information Service is mandated to maintain a repository of current toxicologic and occupational health literature and to provide up-to-date information on the health hazards of workplace materials. In addition to its other functions described elsewhere,³ HESIS provides information through its hot line, the Telephone Inquiry/Response System (TIRS), to employees, employers, health care providers, unions, and government agencies within California.⁴ Since 1980, this hot line has responded to more than 11,000 inquiries, including over 2,000 regarding the effect of occupational exposures on pregnancy. Risk to pregnancy is now the primary interest of over 30% of callers.

Other pregnancy information systems have been devel-

oped in California and elsewhere, but they tend to focus more on drug usage and low-level chemical exposures in nonoccupational settings.⁵⁻⁸ Our eight-year experience operating the TIRS hot line has enabled us to present descriptive data on concerns about reproductive hazards in the workplace and to comment on some issues we have encountered.

Methods

After confidentiality has been assured, information in the following categories is obtained from callers and recorded on a standard form:

- Primary interest (including—in order of highest to lowest priority—risks to pregnancy, relation of symptoms to work, or general health hazard information)
- Referral source
- Substances
- Exposure
- Question
- Caller (employees, employers—including supervisors, managers, company health and safety and medical personnel—health care providers, governmental representatives, and others).

Information—callers, substances, primary interests, questions—is recorded in a logbook, and callers and primary interest categories are coded prospectively.

Data were summarized for three time periods: 1981 through 1986, 1983, and 1986. The number of pregnancy-related inquiries and callers' occupations and organizations were counted from the logbooks for the period 1981 through 1986. Data on referral sources were obtained by consulting original inquiry forms from 1983 and 1986. Industries, occupations, and agents of concern, agents most frequently

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ABBREVIATIONS USED IN TEXT

CNS = central nervous system
 CTR = California Teratogen Registry
 HESIS = Hazard Evaluation System and Information Service
 SIC = Standard Industrial Classification
 TIRS = Telephone Inquiry/Response System
 VDT = video display terminal

inquired about, symptoms, and staff recommendations were obtained by consulting original inquiry forms for 1986.

Results

Figure 1 shows the annual volume of pregnancy-related TIRS inquiries and the total inquiry count from 1981 through 1986. The number of inquiries concerning risks to pregnancy increased dramatically during this six-year period. There was a 17-fold increase between 1981, when 34 pregnancy-related inquiries were received, and 1986, when the number totaled 593. The proportion of all pregnancy-related TIRS inquiries increased from 4% in 1981 to 24% in 1986.

In addition to information concerning pregnancy risks, for which an average of 217 inquiries per year were received, callers also requested general health-hazard information on workplace agents (average of 848 inquiries per year) and asked about the work-relatedness of symptoms (average of 303 inquiries per year). The overall increase in calls in 1985 and 1986 was because of an increased number of requests in all three categories. Requests for general health-hazard information showed the greatest volume increase.

New callers usually reach the TIRS through referrals by organizations or by persons familiar with it. The amount of advertising of the TIRS has been limited and did not change substantially between 1981 and 1986. To determine whether the increased volume of pregnancy-related inquiries had been generated by new referral sources, we compared the referral patterns for 1983 and 1986. These data are shown in Table 1.

The Toxics Information Center, a hot line primarily for nonoccupational exposures and hazardous materials emergencies, was the only new source of referrals since 1983 but generated only 33 additional calls in 1986; hence, new referral sources did not account for the overall increase in pregnancy-related inquiries. Instead, the increase was be-

cause of more referrals from all existing sources. The California Teratogen Registry (CTR), which provides risk counseling primarily for prescription drug use,⁸ referred only six callers in 1983 compared with 200 in 1986 and currently represents our largest source of referrals. Health care providers are generally familiar with the CTR and are likely to call it themselves or to refer patients to it when questions arise regarding reproductive effects of workplace agents. In turn, CTR counselors refer to the TIRS callers concerned about occupational exposures. Table 1 also shows that most referrals are from individual health care providers and institutions or agencies providing health care or health counseling or both. Consistent with this fact, most (83%) repeat callers were genetics counselors, physicians, and nurses.

Figure 2 shows the frequency of pregnancy-risk inquiries by major caller group from 1981 through 1986. Most requests were from employees and health care providers. Before 1984, the number of calls from employees and health providers was about the same. Beginning in 1984, however, a much higher proportion of calls was received from employees.

Table 2 shows the caller distribution for 1986 pregnancy inquiries. Employees accounted for 70% of the inquiries; 23% were from health care providers including physicians (57%), genetic counselors (26%), and nurses (17%). Most physicians who called were in private practice (72%); fewer were associated with hospitals or clinics (23%).

Only 3% of the 1986 pregnancy-related calls were from employers, and only 1% were from government agencies. The government agency calls were from the California Occupational Safety and Health Administration medical and industrial hygiene personnel and from state and county health department personnel.

As shown in Figure 3, which summarizes 1986 data, calls

TABLE 1.—Referral Sources for Pregnancy-Related TIRS Inquiries, 1983 and 1986

Source	1983		1986	
	No.	(%)	No.	(%)
Previous callers*	15	(26)	43	(7)
Government agencies†	8	(14)	35	(6)
California Teratogen Registry	6	(10)	200	(34)
Hospitals and clinics‡	3	(5)	79	(13)
Physicians	8	(14)	57	(9)
Literature and conferences	3	(5)	33	(6)
Poison control centers	2	(3)	28	(5)
Toxics Information Center	..	(.)	33	(6)
Miscellaneous other	4	(7)	38	(6)
Unknown	9	(15)	47	(8)
Total	58	(99)	593	(100)

TIRS=Telephone Inquiry/Response System

*Repeat callers; no referral.

†Primarily the California Occupational Safety and Health Administration.

‡Primarily Kaiser Foundation Hospitals, California, in 1986.

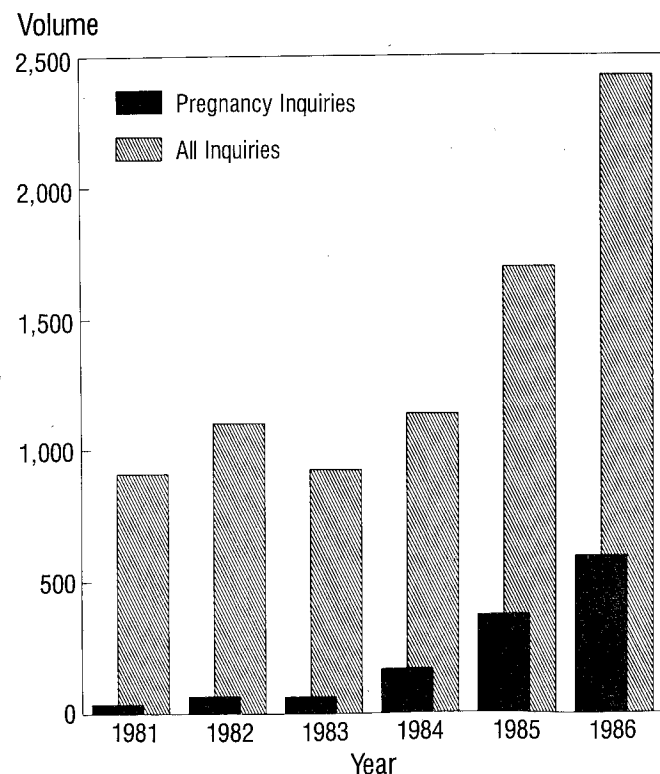


Figure 1.—The annual volume of all inquiries to an occupational hazard hot line is compared with that concerning pregnancy.

TABLE 2.—*Caller Distribution for Pregnancy Inquiries, 1986*

Caller	No. (%)
Employee	416 (70)
Health care provider	136 (23)
Employer	19 (3)
Government agencies*	6 (1)
Other†	16 (3)
Total	593 (100)

*California Occupational Safety and Health Administration accounted for 4 of 6 government agency calls.
†Includes unions, insurance companies, attorneys, and the like.

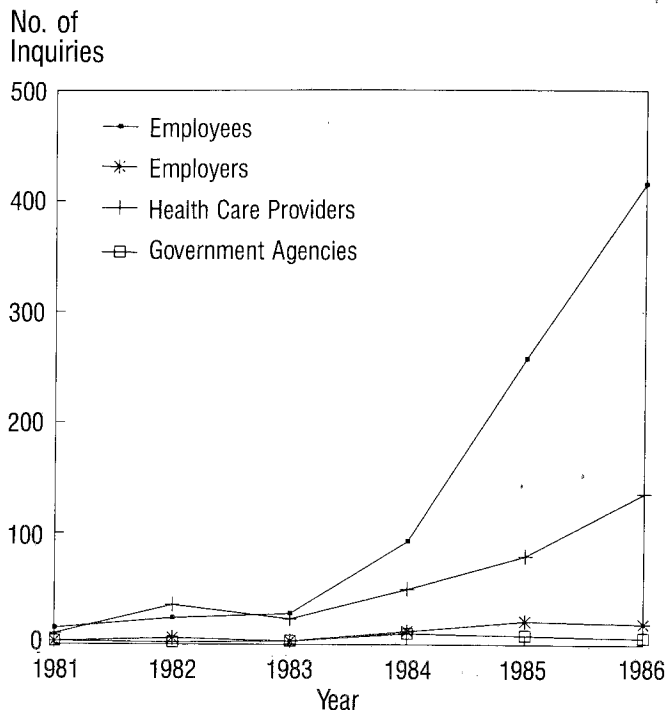


Figure 2.—The annual frequency of pregnancy-related inquiries to an occupational hazard hot line by caller group is shown.

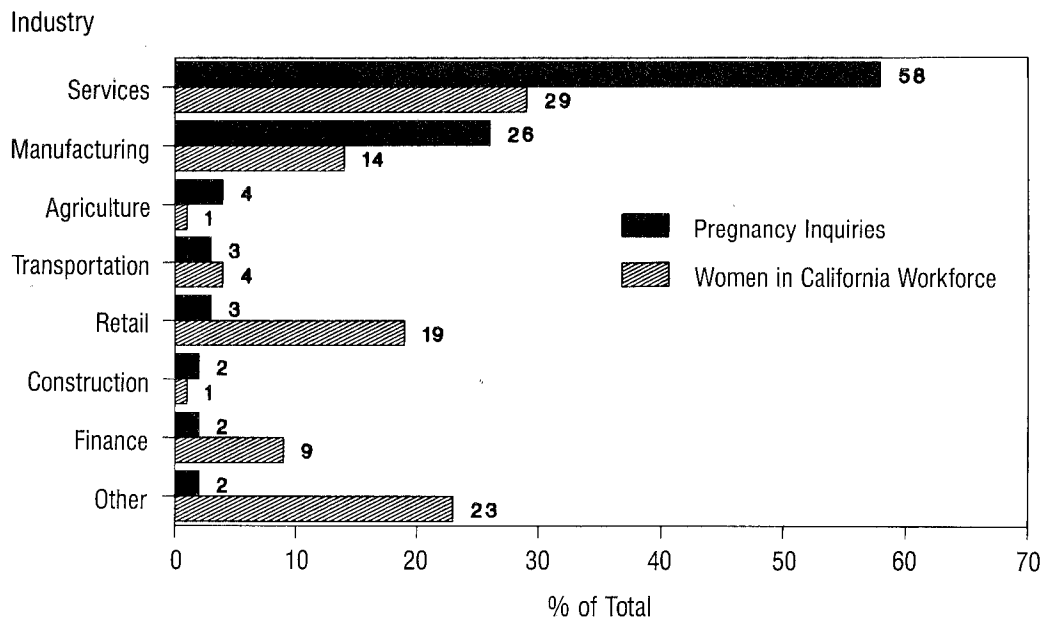


Figure 3.—The 1986 distribution (%) by industry of inquiries to an occupational hazard hot line is compared to the percentage of women in the California workforce working in that industry.

were received regarding pregnant workers in all sectors of California industry. Most inquiries concerned employment in service (58%) and manufacturing (26%) industries. As a point of reference, the service and manufacturing sectors represented 29% and 14%, respectively, of all nonagricultural employment of women in California in 1986.¹⁰ Tables 3 and 4 describe typical occupations and agents of concern in the service and manufacturing industry inquiries.

Approximately 40% of service sector inquiries concerned employment in the business services (Standard Industrial Classification [SIC] code 73) (Table 3). Most (65%) of these employees were office workers. Their primary concerns included the use of video display terminals (VDTs) and exposure to organic solvents in carpet adhesives and paints, pesticides, and roofing tar fumes. Since chemical exposure of office workers generally is transient and involves low airborne concentrations,¹¹⁻¹⁴ it usually presents little hazard to pregnancy. Radiation levels of VDTs, perceived to be a pregnancy risk by many office workers consulting the TIRS, have not been found excessive when measured.¹⁵ While a recent study did suggest that some women using video display terminals for more than 20 hours a week were at increased risk for spontaneous abortion, no definite association was made between abortion and VDT use.¹⁶

Table 4 shows that jobs in the electronics industries (SIC code 36) were the primary occupations of concern in the manufacturing sector. Typical agents inquired about were organic solvents, including methylene chloride and ethylene glycol monoethyl ether (an animal teratogen), a variety of acids, and two human reproductive toxicants—lead and ionizing radiation.

The agents most frequently of concern with regard to pregnancy risks are listed in Table 5. Almost half the agents are organic solvents, which probably reflects their widespread use in California workplaces. We generally recommend that pregnant employees minimize their exposure to organic solvents because these lipophilic substances are usually capable of reaching a fetus. Most organic solvents, how-

ever, have not been adequately studied, and their potential effects on a fetus remain unknown. Frequent inquiries about common acids and ammonia show the need to increase employees' understanding and awareness of hazards as part of hazard communication training, if only to alleviate inappropriate concern, since these agents are not expected to cause adverse effects on reproduction.

Of the 593 pregnancy-related inquiries received in 1986, 80% were simply requests for information about workplace hazards to pregnancy. Concern about symptoms in pregnant employees was expressed in 20%, or 119, calls. Of these calls, 84% were made by the pregnant employee, while 13%

were made by a health care provider calling on behalf of a patient.

Inquiries about symptom-related pregnancy primarily were from employees in the services (45%) and manufacturing (29%) sectors. Most frequently reported symptoms were consistent with central nervous system (CNS) depression and eye, nose, and throat irritation. Only a few calls concerned spontaneous abortion, stillbirth, or birth defects.

After careful evaluation of the information provided by the callers, responses to the symptom inquiries included the following:

- General toxicity and industrial hygiene information

TABLE 3.—Service Industries, Typical Occupations, and Agents Inquired About During Pregnancy-Related Inquiries, 1986*

Industry†	Occupation	No.	Agents
Business (N=115‡)	Office workers	75	VDTs, carpet adhesives, pesticides, roofing tar fumes, paint
	Photo lab technicians	16	Hydroquinone, acetic acid, aluminum thiosulfate, silver nitrate, organic solvents, mercuric chloride
	Blueprint operators	6	Ammonia
Health (N=62)	Dental assistants	15	Nitrous oxide, mercury, radiation, methyl methacrylate
	Nurses	8	Antineoplastic drugs, formaldehyde, ethylene oxide
	Hospital workers	7	Ethylene oxide, glutaraldehyde, antineoplastic drugs
	Hospital lab technicians	6	Xylene, miscellaneous organic solvents, formaldehyde
	Laboratory technicians	6	Ethidium bromide, biologic hazards
Personal (N=57)	Manicurists	26	Acrylic nail-grooming products (acrylates)
	Cosmetologists	18	Hair dyes, permanent-wave solutions
	Custodians	6	Ammonia, alcohol, sodium hypochlorite (bleach), cleaners containing glycol ethers
Miscellaneous (N=29)	Artists	15	Organic solvents, epoxy resins, fiberglass, pigments, lead
	Writers	4	VDTs, organic solvents
Engineering, accounting, research, management, and related services (N=19)	Lab researchers	8	Formamide, benzene, hydrazine, chloroform, mercury
Educational services (N=15)	Teachers	11	Pesticides, organic solvents, carpet glues, methanol, roofing tar fumes

VDT=video display terminal

*Represents employee industries based on inquiries from employees, employee representatives, and employers. Total service industry inquiries=314.

†Standard Industrial Classification Manual, 1987.

‡N=Total inquiries per industry.

TABLE 4.—Manufacturing Industries, Typical Occupations, and Agents Inquired About During Pregnancy-Related Inquiries, 1986*

Industry†	Occupation	No.	Agents
Electronics and electrical machinery and supplies (N=51‡)	Electronics assemblers, solderers, wafer fabricators, microchip handwashers and inspectors	45	Lead, solder flux, ethylene glycol monoethyl ether, other organic solvents, acids, phenol, radiation
Printing, publishing, and allied industries (N=24)	Printers	10	Organic solvents, inks, acrylic monomers, polyglycols
	Print-shop workers	3	Trichloroethane, isopropanol, ethylene glycol monobutyl ether
	Bookbinders	2	Organic solvents
	Photolithographers	2	Hexamethyldisilane, xylene
Fabricated metal products, except machinery and computer equipment (N=9)	Electroplaters	3	Nickel, cyanide, nitric and sulfuric acid, sodium hydroxide
	Solderer, degreaser, packer, fabricator	4	Ethylene glycol, xylene, Freon, acetone, hydrogen fluoride
Chemicals and allied products (N=7)	Chemical workers	2	Methylene chloride, phosgene
	Herbicide manufacturing workers	2	Hexachlorobenzene, hexachloropyridine, monoethanolamine
Food and kindred products (N=7)	Tortilla maker	1	Graphite, kerosene
	Fumigator	1	Ethylene oxide, methyl bromide
	Winery worker	1	Sulfur dioxide
	Cannery worker	1	Chlorine dioxide
Transportation equipment (N=5)	Aerospace parts etcher, window maker, parts cleaner, assembler	4	Toluene, xylene, methyl ethyl ketone, nitric acid, acetone, hydrochloric acid

*Represents employee industries based on inquiries from employees, employee representatives, and employers. Total manufacturing industry inquiries=142.

†Standard Industrial Classification Manual, 1987.

‡N=Total inquiries per industry.

when exposure appeared to present no increased risk to the pregnant worker (40%). For example, a pregnant office worker exposed to irritating ammonia vapors from a blue-print machine was informed about the toxicity of ammonia and was reassured that the exposure would not pose a risk to the fetus;

- Specific advice on reducing exposure when there was a possibility of increased risk from overexposure (29%). For example, a pregnant anesthesiologist experiencing headaches at work was advised of the risks associated with exposure to anesthetic gases and of the need to reduce her exposure to them. We recommended that the scavenging system be inspected, repaired, and air monitoring done;

- Recommendations that pregnant workers be removed from exposure when the likelihood of an increased risk of an adverse outcome was high (13%). For example, an electronic wafer fabricator using many organic solvents and suffering CNS depression was strongly urged to stop her current work, preferably through a job reassignment or disability leave if available.

Included in the remaining responses were advice to file a complaint with the California Occupational Safety and Health Administration and recommendations for medical surveillance or specific laboratory tests. Information on disability leave and employees' legal rights was also provided for persons advised to reduce exposure to—or avoid altogether—potentially dangerous agents.

Discussion

An increased use of the TIRS to obtain information about workplace pregnancy hazards and the proliferation of other pregnancy hot lines in the past decade reflect the public's growing concern. The variety of industries, occupations, and workplace agents represented in our data base indicates that concern about workplace hazards to pregnancy is felt by women in all sectors of California's work force.

Employees and health care providers were the major groups requesting pregnancy risk information through the TIRS from 1981 through 1986. In contrast, employers, government agency representatives, and union representatives—who called frequently for information on general health hazards of workplace agents and the work-relatedness of symptoms—rarely called about pregnancy hazards.

Referral sources for pregnancy-related inquiries were almost exclusively health care providers or institutions that provide health care or health counseling or both. Again, this contrasts with the referral pattern for non-pregnancy-related inquiries, for which the California Occupational Safety and Health Administration was a major referral source.

The referral pattern and caller distribution of pregnancy-related inquiries suggest that women initially seek information on their own or from their health care providers instead of from their employers. Because of a fear of discrimination, pregnant employees may not consult employers; if employers are consulted, they may in turn refer employees to their health care providers.

Employers may not provide relevant advice and training about pregnancy risks because this information is often not included on material safety data sheets, which appear to be employers' primary source of health hazard information. Several factors contribute to this lack of information. First, reproductive toxicity data are rarely available because most

agents have not been tested for this end point. Second, even when data are available, it is often difficult and sometimes impossible to extrapolate outcomes in animal models to outcomes in humans. Agencies analogous to the National Toxicology Program, which routinely conducts standardized animal cancer tests on chemicals, and the International Agency for Research on Cancer, which evaluates the results of cancer bioassays and cancer epidemiologic studies, do not yet exist as resources for obtaining information on potential reproductive toxicants.

The limitations we have described make it difficult to assess the risk to pregnancy from workplace agents. Employers, however, still have the initial responsibility to provide training, because this is legally mandated by the Hazard Communication Standard. In addition, employers have access to information regarding the extent of employees' exposure to workplace agents that is essential for assessing potential health hazards. That so few employers call for information and that so few women are referred by their employers suggest that this mandated training is not being conducted.

Health care providers should not be expected to assume an employer's role as the primary source of information about workplace pregnancy hazards. Our calls indicate that most health care providers lack a knowledge of workplace agent toxicity to reproduction and rarely know the extent of employees' exposure to potentially harmful agents. Health care providers do, however, have a responsibility to their

TABLE 5.—Agents Most Frequently of Concern in Pregnancy-Related Inquiries, 1986

Agent	No. of Inquiries*
Organic solvents, not otherwise specified	45
Pesticides	41
Acrylates†	39
Acids	34
Paints	33
Acetone	30
Ammonia	24
Lead‡	23
Video display terminals	23
Xylene§	23
Isopropanol	21
Fluorocarbons	19
Trichloroethane§	19
Toluene§	17
Formaldehyde	14
Methyl alcohol§	14
Methylene chloride§	14
Nitrous oxide	14
Petroleum distillates	14
Solder fumes	13
Glycol ethers	12
Methyl ethyl ketone§	12
Photography chemicals	12
Mercury, metallic	11
Permanent-wave products	11
Hair dyes	10

*Number of times agent was inquired about may not represent distinct consultations since one consultation often involved multiple agents.

†Acrylic nail products (N=34); methyl methacrylate (N=5).

‡Known human reproductive toxicant.

§Possible human reproductive toxicant.

||Probable human reproductive toxicant.

pregnant patients to consider workplace risks. They should routinely obtain an occupational history and ask about workplace exposures. This is best done before pregnancy or during early prenatal visits. Combining information about workplace exposure to toxic agents with nonworkplace factors such as nutrition, genetic risk factors, smoking history, and alcohol and other drug intake is important when weighing risks for adverse pregnancy outcomes. Training in occupational health and reproductive toxicology is essential for ensuring that risk assessment is done adequately.

In assessing risks to their pregnant patients, health care providers must often distinguish between "worried-well" employees, such as office workers transiently exposed to low concentrations of organic solvents in carpet adhesives, and "potentially-at-risk" employees, such as electronics workers regularly exposed to high concentrations of organic solvents and experiencing symptoms consistent with overexposure. Several information sources can assist health care providers in making this distinction.¹⁷⁻¹⁹

Health care providers should also be aware of and prepared to respond to certain medicolegal issues that we have encountered with increasing frequency. A key issue is whether pregnant women should continue working during pregnancy. This decision must be made on a case-by-case basis and should take into account each woman's desire or need to continue working and the potential for reproductive harm if she does so. Unfortunately, only limited options are available to pregnant employees who decide to stop working.²⁰ An important recourse involves qualifying for pregnancy-related disability, as employees who are disabled because of pregnancy legally must be treated the same as any other disabled employee; however, the scope of a pregnancy-related disability has not been defined. Regardless of an employer's disability policy, current California law allows pregnant women four months of unpaid leave.

A new and growing controversy now affecting health care providers concerns "letters of certification," an apparent attempt by some employers to avoid potential liability. These letters are sent by employers to pregnant employees' health care providers. Often accompanied by an extensive list of chemicals, the letters ask health care providers to review the list and certify that no harm will come to the employee or her fetus from continued chemical exposure. Some women have been threatened with layoff if the letter is not returned with a physician's signature. It is impossible for anyone to guarantee freedom from risk, and health care providers should not feel responsible for doing so. Coercing physicians to sign such letters or laying off employees whose physicians refuse to sign raises legal issues yet to be addressed. We advise health care providers not to sign letters of certification. If, as a result, pregnant patients are threatened with job loss or an-

other form of discrimination, they should be referred to an agency or organization representing employees' legal rights.

Conclusion

Until there is routine testing and identification of potential reproductive toxicants, guidelines for assessing their risks, occupational health standards reflecting reproductive toxicity, and improved implementing of the Hazard Communication Standard, complex medical, legal, and toxicologic issues will continue to arise. Meanwhile, pregnant employees should not be made responsible for obtaining reproductive toxicity information. Employers are obligated to provide a safe work environment and accurate information on toxicity of agents and exposures to them in the workplace, and health care providers are responsible for guiding pregnant women in making appropriate, informed decisions regarding potential health risks.

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